EXOTICS

Project title:	**Assessing the Expansion Risk of an Exotic Snail across Habitats**
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Objective: Collection of an exotic species of snail (*Potamopyrgus antipodarum*), estimates of their density in different locations, measurement of genetic (clonal) diversity of invading populations, estimates of their life-history characteristics, preliminary assessment of their effect on native aquatic macroinvertebrates, and establishment of sites for future monitoring.

Findings: We established experiments to examine competition between mud snails and native macroinvertebrates, and the impact of mud snails on periphyton density. To continue the study of invasion potential, I am studying life-history traits of mud snails under ambient conditions alongside temperature data loggers. We placed data loggers in the Firehole River, Fairy Creek, and at two invasion fronts: Iron Spring Creek and Little Firehole River. At sites with temperature loggers, I placed specific size classes of mud snails in cage enclosures and collected these cages later to measure growth and reproductive rates under a measured temperature regime. These cage experiments will continue during each season. One goal is to determine limiting conditions for mud snail growth and reproduction. Samples are currently housed at Ohio University and Montana State University.

Project title: **Evaluating Impacts of an Introduced Biological Control Agent, the Seven-Spotted Ladybird Beetle, on Native *Coccinella* in Natural Areas of the Northern Rocky Mountains**

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Objective: 1) Better document geographic extent of invasions of seven-spotted ladybird beetle (*Coccinella septempunctata*) (C-7) in northern Rocky Mountain national parks. 2) Estimate and compare historical vs. contemporary relative abundances of *Coccinella* species in these areas. 3) Identify species of *Coccinella* that may have been impacted by invasions of C-7. 4) Provide baseline data for assessing impacts of other exotic ladybird beetles (particularly, *Harmonia axyridis*) that are known to be expanding their range and which may ultimately have significant impacts on native species. 5) Help identify appropriate research and/or management responses in light of the above findings.

Findings: In 1999, 1,257 specimens of eight *Coccinella* species were collected in Yellowstone Natioanal Park and curated at Montana State University. Sixty-one historical specimens were examined in various museums. The exotic *C. septempunctata* (C-7) comprised 62% of the 1999 specimens. Relative abundances of two native species declined significantly ($P < 0.05$) after invasion by C-7. Historically, *C. novemnotata* and *C. trifasciata* comprised 16% and 31%, respectively, of *Coccinella* collected in YNP; but only 0.2% and 1%, respectively, of *Coccinella* collected in 1999. Relative abundances of five other native *Coccinella* species showed no changes, but the power to detect change was low for four of these due to small historical sample sizes. We conclude that C-7 has had a major adverse impact on native *Coccinella* in YNP. Results from other northern Rocky Mountain parks are consistent with this conclusion. A final report is in preparation.